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AGRICULTURE

No. 71

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CHINA REPORT

AGRICULTURE

No. 71

CONTENTS

CONTENTS (Continued)   Page

CONTENTS (Continued)   Page

I. GENERAL INFORMATION

WINTER WHEAT PRODUCTION, METEOROLOGICAL FACTORS ANALYZED

[Article by Wang Shiqi [3769 0013 5075], Cao Yonghua [2580 3057 5478] and Cai Yongce [5591 3057 1964] of the Meteorological Research Laboratory of the Chinese Academy of Agricultural Sciences: "Winter Wheat Production in the Beijing Region and Statistical Analysis of Meteorological Factors"]

[Text] People are very concerned about the problem of large scale fluctuations of yields of farm crops over large areas. Experience shows that this kind of fluctuations are very closely related to the weather and climate.

Since implementation of the people's communes in our nation in 1958, the conditions for agricultural production have changed greatly and in particular, water conservancy in farmland has improved visibly. Now let us ask the question: For several years recently, what has been the nature of the dependence of yield upon weather conditions? Under present conditions, which meteorological factors are the major factors that affect changes in yield? From the viewpoint of agrometeorology, what are the problems which should be taken into consideration in cultivation and management? This article takes the winter wheat in the Beijing region as an example in the preliminary discussion of these problems.

Method

A quantitative study of the relationship between the yield of crops and meteorological conditions can be done in many ways. One way is the use of data on harvests and yields under natural conditions over many years and data on climatological observations to perform statistical analysis.

Statistical methods, generally speaking, cannot reveal the inner casual relationships of anything. But they are often a powerful tool for establishing external relationships among things and for differentiating the primary and secondary conflicts objectively among numerous and complicated but generally established facts. They do not require sophisticated facilities for observation nor more preparatory work as foundations. Practice

also proves that as long as the data used for compilation of statistics is sufficiently rich and reliable, and the mathematical model so designed is reasonable, good results can be obtained. Thus statistical methods are still being used (2) (4). This article will also use this method.

Our purpose is first to understand the major meteorological factors affecting yield and at the same time we hope to obtain information regarding seasonal changes causing such effects. To do this we applied the concept of integral regression by R. A. Fisher (1) to establish the statistical model in this article.

Let the yield and the many meteorological factors have the following relationship:

$$\hat{y} = C + \sum_i \int_0^{\tau} b_i(t) \cdot x_i(t)\, dt$$

(1)

where $\hat{y}$ is the estimated yield, C is the constant, $X_i(t)$ is the indexed ith meteorological factor, $b_i(t)$ is the coefficient of the effect of $X_i(t)$ on the yield y, t is time, τ is the growth period of the crop.

Let $b_i(t)$ represent the linear function of the orthogonal polynomial of time t, i.e.,

$$b_i(t) = \sum_j b_{ij} \xi_j \qquad (i = 1, 2, \cdots\cdots)$$

(2)

where ξ_j is the polynomial of the jth power, b_{ij} is the constant coefficient. Substituting (2) into (1) we obtain

$$\hat{y} = C + \sum_i \int_0^{\tau} \sum_j b_{ij} \cdot \xi_j \cdot x_i(t)\, dt$$

$$= C + \sum_i \sum_j b_{ij} \int_0^{\tau} \xi_j \cdot x_i(t)\, dt$$

$$= C + \sum_i \sum_j b_{ij} \cdot \varphi_{ij}$$

where

$$\varphi_{ij} = \int_0^{\tau} \zeta_j \cdot x_i(t)\, dt, \quad i = 1,\ 2,\ j = 0, 1, 2,\ \cdots\cdots.$$

(3)

In actual calculation, ξ_j and $X_i(t)$ are taken as discrete numbers, i.e.,

$$\varphi_{ij} = \sum \xi_j x_{it},$$

2

where φ_{ij} is the new variable after transformation of X_i, abbreviated as the jth term of X_i. Here, each new variable and coefficient of regression is represented by two subscripts, the first subscript i being the order of the original variable and the second subscript j being the power of the polynomial. Also, all new variables are classified into two groups. When $j = o$, the influential factor is the cumulative value of elements X_i during the period of growth. When $j \neq 0$, the influential factor is the way of temporal distribution of the elements.

Let all variables in (3) be replaced by normalized numbers, then we can obtain the regressive equation

$$\widehat{y}^{\bullet} = \sum_i \sum_j b_{ij}^{\bullet} \cdot \overline{\varphi}_{ij}^{\bullet}, \tag{4}$$

where

$$y^{\bullet} = \frac{y - \overline{y}}{S_y}, \quad \varphi_{ij}^{\bullet} = \frac{\varphi_{ij} - \overline{\varphi}_{ij}}{S_{\bullet ij}}$$

All symbols with '*' represent normalized numbers, $\overline{y}$ and $\overline{\varphi}_{ij}$ are the average values over many years of Y and φ_{ij} respectively. Sy and $S\varphi_{ij}$ are the respective standard deviations of Y and φ_{ij}.

The precision of the analysis can be elevated by normalization of the numbers as done above and by treating data of many years and of many localities as statistical samples under the same test conditions.

The second power equation of (4) for a locality designated as h yields the group of normal equations that determine $b_{ij}^{\bullet(h)}$

$$R^{(h)}B^{\bullet(h)} = C^{(h)}, \tag{5}$$

where

$$R^{(h)} = \begin{pmatrix} r_{10,10}^{(h)} & r_{10,11}^{(h)} \cdots r_{10,1j}^{(h)} \cdots r_{10,ij}^{(h)} \cdots \\ r_{11,10}^{(h)} & r_{11,11}^{(h)} \cdots r_{11,1j}^{(h)} \cdots r_{11,ij}^{(h)} \cdots \\ \cdots\cdots \\ r_{1j,10}^{(h)} & r_{1j,11}^{(h)} \cdots r_{1j,1j}^{(h)} \cdots r_{1j,ij}^{(h)} \cdots \\ \cdots \\ r_{ij,10}^{(h)} & r_{ij,11}^{(h)} \cdots r_{ij,1j}^{(h)} \cdots r_{ij,ij}^{(h)} \cdots \\ \cdots \end{pmatrix}$$

$$B^{\bullet(h)} = \begin{pmatrix} b_{10}^{\bullet(h)} \\ b_{11}^{\bullet(h)} \\ \vdots \\ b_{1j}^{\bullet(h)} \\ \vdots \\ b_{ij}^{\bullet(h)} \\ \vdots \end{pmatrix}, \qquad C^{(h)} = \begin{pmatrix} r_{10}^{\bullet(h)} y \\ r_{11}^{\bullet(h)} y \\ \vdots \\ r_{1j}^{\bullet(h)} y \\ \vdots \\ r_{ij}^{\bullet(h)} y \\ \vdots \end{pmatrix},$$

3

and $r^{(h)}_{\ldots\ldots}$, $i?j?$ are the correlation coefficients of $\varphi^{(h)}_{\ldots\ldots}$ and $\varphi^{(h)}_{\ldots\ldots}$, $r^{(h)}_{ij,y}$ are the correlation coefficients of $\varphi^{(h)}_{\ldots}$ and $y^{(h)}$, and $b^{*}_{ij}{}^{(h)}$ are normalized factors $\varphi^{*(h)}_{\ldots}$.

Let $b^{*}_{ij}{}^{(h)}$ take the same value for localities which are geographically near and where natural conditions are similar, then (5) can be simplified to

$$RB^{\bullet} = C \qquad (6)$$

where

$$R = \sum_{h} R^{(h)}, \qquad C = \sum_{h} C^{(h)},$$
$$B^{\bullet(1)} = B^{\bullet(2)} = \cdots = B^{\bullet(h)} = \cdots = B^{\bullet}.$$

In (6), R and C both can be obtained from actual data and thus B* is not hard to solve.

To assure that the final regressive equation contains only the few outstanding variables and that they are the best factors among all possible factors, this article will use a step by step regression to establish (4). Since variables $X_j(t)$ have already been transformed to φ_{ij}, the variables introduced into the equations not only will be able to reflect the importance of certain meteorological factors but at the same time by equation (2) they will also give information about seasonal changes of these factors that affect yield. Finally, by

$$b^{(h)}_{ij} = b^{*}_{ij} \cdot S^{(h)}_y / S^{(h)}_{\ldots},$$
$$C^{(h)} = \bar{y}^{(h)} - \sum_i \sum_j b^{*}_{ij} \cdot S^{(h)}_y \cdot \bar{\varphi}^{(h)}_{ij} / S^{(h)}_{\bullet} \qquad (7)$$

we can obtain the regression coefficient $b_{ij}(h)$ and the constants $C^{(h)}$ of the nonnormalized numbers $\varphi^{(h)}_{ij}$ corresponding to each locality. In (7), $S_y{}^{(h)}$ and $S\varphi_{ij}(h)$ are the respective standard deviations of the yield $Y^{(h)}$ and the variables $\varphi^{(h)}_{ij}$ at point h.

Source of Data

Meteorological data and data of single yields of wheat in 7 (wards) counties of the Beijing suburb have been included in this article. The wheat fields in these (wards) counties are mostly irrigated fields and they all lie in the southeastern plains of Beijing. The differences in soil and climatic conditions are not great.

The yields of various localities show definite temporal trends which must be eliminated in the actual amount of yield. The yields after such treatment are listed in Table 1.

4

Table 1 Yields* (jin/mu) of each (ward) county over the years

1)地 点 年度 2)	顺 3)又 1	4)平 谷 2	通 5)县 3	大 6)兴 4	朝 7)阳 5	海 8)淀 6	丰 9)台 7
1957-1958			38.3	...	.	~12.0	
1958-1959			36.8			-3.5	
1959-1960	-31.4		-29.5	-8.1	-1.7	3.4	-1.8
1960-1961	-54.5	-59.7	-86.3	-41.9	-62.6	-15.0	-63.6
1961-1962	-10.3	-32.0	-23.2	-29.3	-1.0	-9.3	-61.8
1962-1963	19.8	-15.5	5.7	0	32.8	29.4	18.6
1963-1964	33.9	43.0	5.6	0.7	-38.4	-57.5	-41.7
1964-1965	49.5	71.0	58.1	58.2	66.2	40.5	53.7
1965-1966	34.8	65.1	49.7	30.5	117.0	101.0	85.8
1966-1967	4.9	41.1	27.6	15.4	37.1	11.3	-20.6
1967-1968	-84.7	-64.5	-55.7	-61.6	-100.5	-77.5	-90.1
1968-1969	8.5	19.7	8.7	11.9	-16.1	13.7	12.0
1969-1970	-19.2	-75.3	-36.5	-2.6	-63.7	-18.5	-70.0
1970-1971	-26.9	-64.5	-30.2	-9.4	-57.9	-31.4	-56.8
1971-1972	-13.6	-28.5	7.1	-13.5	33.5	18.1	-20.9
1972-1973	49.3	22.9	48.6	16.0	55.2	26.1	51.4
1973-1974	1.3	56.4	-17.6	-0.8	16.0	-18.2	92.2
资料年限 10)	15	14	17	15	15	17	15

*The difference between actual yield and temporal trend. All yields in the following are computed in this way.

Key:
1. Locality
2. Year
3. Shunyi
4. Pinggu
5. Tongxian
6. Daxing
7. Zhaoyang
8. Haidian
9. Fengtai
10. Number of years of data

The positive and negative signs indicate respectively increases or decreases in yield resulting from the influence of factors excluding factors of production techniques.

The most fundamental agrometeorological conditions for the growth of crops are light, water and temperature. If human influences are not considered, then the amounts of such conditions actually received by the crops can be approximately expressed as qualitative descriptions by the number of hours of sunshine, the amount of rainfall and the average temperature recorded in the meteorological data of the locality. In addition, wheat planted over large areas in the Beijing suburb is sown about October 1 and harvested around June 15. For convenience, this article uses the amount of rainfall (X_1) of each ten-day period between October 1 and June 15, the number of hours of sunshine (X_2) and the average temperature (X_3) as the three major

meteorological elements in the basic meteorological data in the analysis. The entire growth period is divided into 26 phases. Each phase covers 10 days except for the last which only covers 5 days.

According to experience, the seasonal change of the influence of any meteorological element upon the yield can be sufficiently expressed by the orthogonal polynomial using the terms of fewer power. Terms of the fifth power are the highest power terms used in this article.

Statistical Results

Equation (6) statistically obtained is a group of linear equations containing 19 variables. The equations in (6) are solved by step-by-step regression. The value of F of the introduced and the eliminated factor equals 7. Thus 6 factors are selected corresponding to $\varphi_{1,2}$ of rainfall, $\varphi_{2,4}$ of exposure to light and $\varphi_{3,1}$, $\varphi_{3,2}$, $\varphi_{3,3}$, and $\varphi_{3,5}$ of temperature.

The corresponding normalized regression coefficients are

$b^*_{1,2} = 0.195,$ $\qquad\qquad\qquad b^*_{2,4} = 0.494,$

$b^*_{3,1} = -0.958,$ $\qquad\qquad\qquad b^*_{3,2} = -0.414,$

$b^*_{3,3} = 0.31,$ $\qquad\qquad\qquad b^*_{3,5} = 0.547.$

From (7), the regression coefficients and constants for each (ward) county have been obtained and have been listed in Table 2. According to Table 2 and formula (2) we can obtain the coefficient $b_i^{(h)}(t)$ of the effect of factor $X_i(t)$ at each locality. Diagrams 2-4 show the graphs of the functions $b_i(t)$ for three (wards) counties. Those for the remaining (wards) counties are similarly obtained and are omitted here.

According to Table 2 and formula (3) we can obtain the estimated yield of each locality. Figure 1 illustrates a part of the results. Analysis of the regressive variables is shown in Table 3.

6

Table 2   Partial regressive coefficients $b_{ij}^{(h)}$ of each (ward) county

| 1) 地点   顺 2)文 | 平 3)谷 | 通 4)井 | 大 5)兴 | 朝 6)阳 | 为 7)淀 | 丰 8)台 |
$b_{ij}^{(h)}$ h	1	2	3	4	5	6	7
$b_{12}^{(h)}$	0.00596	0.00649	0.00724	0.00525	0.0089	0.00717	0.0143
$b_{14}^{(h)}$	0.00037	0.00053	0.00042	0.00025	0.00048	0.00044	0.00056
$b_{21}^{(h)}$	−0.261	−0.281	−0.259	−0.19	−0.303	−0.285	−0.428
$b_{12}^{(h)}$	−0.057	−0.069	−0.054	−0.0379	−0.0809	−0.0526	−0.0822
$b_{33}^{(h)}$	−0.00157	−0.00229	−0.00187	−0.00127	−0.00212	−0.00177	−0.0027
$b_{15}^{(h)}$	0.0019	0.00228	0.00217	0.00139	0.00258	0.00217	0.0029
$c^{(h)}$	751.9	859.6	722.9	528.0	931.1	778.4	1163.9

Key:
1. Locality
2. Shunyi
3. Pinggu
4. Tongxian
5. Daxing
6. Zhaoyang
7. Haidian
8. Fengtai

Table 3   Analysis of Variables of Yield

1) 变异来源	2) 平方和	3) 自由度	4) 均方	F
5) 回归	140911.1	6	23485.2	35.3***
6) 误差	63307.8	95	666.38	
7) 总计	204219.0	101		

Key:
1. Source of change
2. Squared sum
3. Degree of freedom
4. Mean square
5. Regression
6. Error
7. Total

Discussion of Several Problems

(1) According to Table 3, changes in the yield of winter wheat and meteorological conditions are highly related. Corresponding to such a large sample as 108, the mere use of a linear model and six variables yields a multiple correlation coefficient of 0.83** which is considered a good result. The estimated yiekd and the actual yield coincide (Figure 1). Some results are even better in analysis of single localities.

For example, using the 15-year data for the Zhaoyang area, four factors have been selected by step-by-step regression with a multiple correlation coefficient as high as 0.965** and a remaining standard deviation of only ±16 jin/mu. It can be seen that during the past decade or so, the harvest of wheat, wheather good or bad, still depends heavily on meteorological elements despite vast improvements in production techniques and conditions.

(2) The cumulative effect of each meteorological element over the entire growth period is not obvious. The six introduced regressive factors do not have subscripts $j = 0$. Factors with subscripts $j = 0$ were not included at all. This reflects the fact that in the Beijing suburb, the conditions of water, light and temperature needed for the growth of wheat, generally speaking, can basically satisfy the needs of the crops but the temporal distribution of each element is frequently inappropriate. Inappropriate timing is therefore an important factor that affects changes in yield.

(3) Of the three meteorological elements of rainfall, sunshine and temperature, the major element that affects yield of winter wheat is temperature.

The single correlation coefficients of each point $\varphi_{ij}^{(h)}$ and $y^{(h)}$ (Table 4) involving the element of temperature are generally higher than the coefficients of sunshine and rainfall. Especially in step-by-step regression, the first three variables introduced into the equations are all temperature terms ($\varphi_{3,1}^{*}$, $\varphi_{3,2}^{*}$, $\varphi_{3,5}^{*}$). In addition, the multiple correlation coefficient of the regression constructed by these temperature terms has already reached 0.752, and the regression coefficient or the coefficient of the effect b_{ij}^{*} are already very close to the final results. The six factors introduced into the equations at the end contain four temperature factors and in the six normal regression coefficients, the values of rainfall and sunshine are much smaller than that of temperature.

The conclusion that temperature is the major factor affecting yield of winter wheat coincides with the conclusion (2) reached in the study of paddy rice. This is noteworthy.
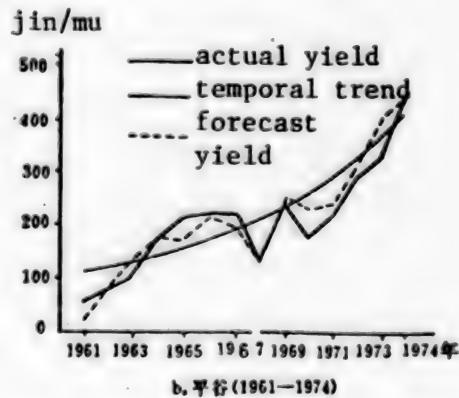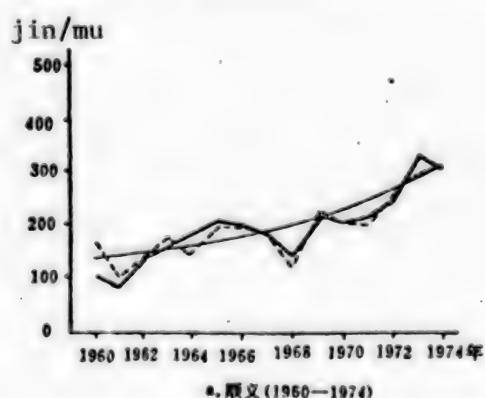
Figure 1 (a-b). Forecast yield, actual yield and temporal trend of winter wheat of various localities
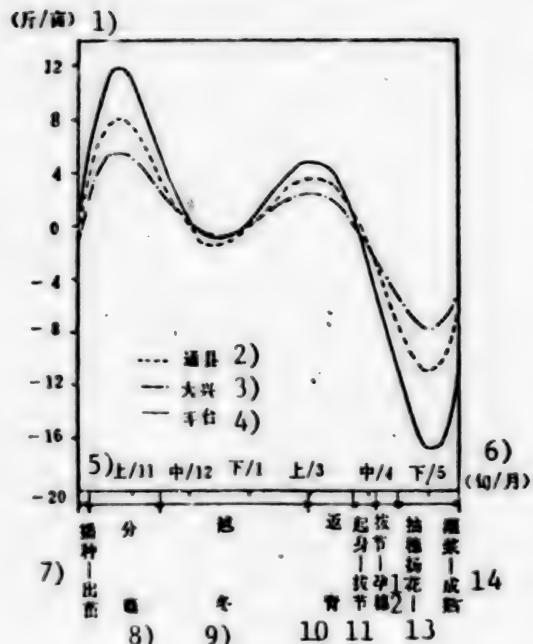
8

Figure 2 The rainfall and sunshine conditions remain the same, the average effect of a rise of one degree in temperature upon the final yield (jin/mu)
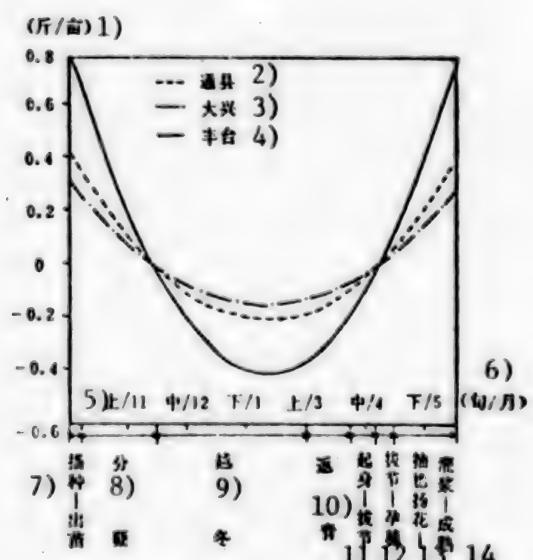
Key:
1. jin/mu
2. Tongxian
3. Daxing
4. Fengtai
5. first/11 middle/12 last/1
   first/3 middle/4 last/5
6. (ten days/month)
7. Sowing germination
8. Tillering
9. Wintering
10. Returning green
11. Raising growth jointing
12. Jointing spike bearing
13. Heading and flowering
14. Filling Maturation

Figure 3 When temperature and sunshine conditions remain the same, the average effect of one millimeter of rainfall upon the yield of winter wheat

Key:
1. jin/mu
2. Tongxian
3. Daxing
4. Fengtai
5. first/11 middle/12 last/1
   first/3 middle/4 last/5
6. (ten days/month
7. Sowing germination
8. Tillering
9. Wintering
10. Returning green Jointing
11. Raising growth Spike bearing
12. Jointing
13. Heading and flowering
14. Filling Maturation

(斤/亩) 1)

0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8

通县 2)
大兴 3)
丰台 4)

5)上/11 中/12 下/1 上/3 中/4 下/5 6)(旬/月)

7) 播种—出苗
8) 分蘖
9) 越冬
10) 返青
起身—拔节
拔节—孕穗
抽穗—开花
灌浆—成熟
11) 12) 13) 14)

Figure 4 When rainfall and temperature conditions remain the same, the average effect of one hour of sunshine upon the final yield (jin/mu)

Key:
See key for Figure 3.

Table 4 Single correlation coefficients of yields and variables φ_{ij}

| 9) 要素 \ 1) 地点		顺 2) 义	平 3) 谷	通 4) 县	大 5) 兴	朝 6) 阳	海 7) 淀	丰 8) 台
降水 10)	φ_{10}	0.41	0.43	0.36	0.06	0.22	−0.01	−0.03
	φ_{11}	0.47	0.15	0.46	0.28	0.06	0.08	−0.07
	φ_{12}	0.04	0.50	0.25	0.22	0.20	0.25	0.44
	φ_{13}	−0.15	−0.17	0.11	0.21	−0.27	0.25	−0.06
	φ_{14}	0.01	0.36	0.02	0.16	0.09	0.29	0.29
	φ_{15}	−0.15	−0.04	−0.16	−0.44	−0.17	−0.28	−0.54*
日照 11)	φ_{20}	−0.52*	−0.59*	−0.45	−0.43	−0.61*	−0.16	−0.44
	φ_{21}	−0.30	−0.27	−0.47	−0.05	−0.17	−0.04	−0.20
	φ_{22}	0.07	0.10	0.20	0.01	0.04	0.02	0.17
	φ_{23}	0.31	0.28	0.11	0.13	0.27	−0.08	−0.29
	φ_{24}	−0.21	−0.12	−0.17	−0.28	−0.26	−0.21	−0.32
	φ_{25}	0.34	0.29	0.20	0.21	0.33	0.16	0.31
温度 12)	φ_{30}	0.01	0.11	−0.03	0.35	−0.07	0.26	0.04
	φ_{31}	−0.68**	−0.56*	−0.68**	−0.55*	−0.69**	−0.49*	−0.48
	φ_{32}	−0.30	−0.41	−0.28	−0.45	−0.09	−0.21	−0.28
	φ_{33}	0.40	0.36	0.27	0.22	0.40	0.14	0.32
	φ_{34}	−0.29	−0.1	−0.24	0.09	−0.21	0.19	0.02
	φ_{35}	−0.33	−0.25	−0.12	0.18	−0.40	0.23	0.08
13) 样本数		15	14	17	15	15	17	15

Key:
1. Locality
2. Shunyi
3. Pinggu
4. Tongxian
5. Daxing
6. Zhaoyang
7. Haidian
8. Fengtai
9. Elements
10. Rainfall
11. Sunshine
12. Temperature
13. Number of samples

10

(4) Changes in temperature during the tillering period prior to winter and the filling period are the major causes of changes in yield.

The effect of temperature upon the yield of wheat has visible seasonal changes. According to Figure 2, the effect of temperature upon yield can be divided into three different periods when rainfall and sunshine conditions do not change. These periods are the tillering period before winter, the period of returning green in early spring and the filling period. Throughout the entire stage prior to winter, the temperature has a positive effect, that is, higher temperatures induce increases in yield. Between the last 10 days of October and the first 10 days of November, the value of such influence reaches the greatest value. Taking Tongxian as an example, at this time, as the 10-day average temperature increases by one degree, the final yield increases by 7 to 8 jin/mu. During the period of returning green of wheat in early spring between February and March, the effect of temperature is also positive but the value of such influence is less than that for the period prior of winter. About the first 10 days of March, a weak positive value occurs. At this time, each increase of one degree yields about 3 to 4 jin/mu more. After April, the value of the influence becomes negative. Its absolute value is equal to that of the period prior to winter. Between the last 10 days of May and the first 10 days of June, the peak filling period of wheat, the negative influence reaches its maximum. At this time, each increase of one degree in temperature will cause a reduction of between 9 and 10 jin/mu in yield.

In (ward) counties where the yield fluctuates on a wider scale, the coefficients of the effect of temperature during the tillering period prior to winter and the filling period are also greater. Table 5 lists the coefficients of the effect of temperature and the standard deviations of the yields of various (wards) counties for three 10-day periods, the last 10 days of October, the first 10 days of March and the first 10 days of May (i.e., $t = 3,16,22$). The results for the rest of the 10-day periods are completely similar. This further indicates that the influence of temperature during the two periods mentioned above is outstanding.

Table 5   Standard Deviations S_y (jin/mu) of the yield and coefficients of the effect of temperatures $b_3(t)$ (jin/mu. degree)

地点 1)	顺义 2)	平谷 3)	通县 4)	大兴 5)	朝阳 6)	海淀 7)	丰台 8)
S_y	36.6	51.0	38.9	27.8	49.7	38.7	56.4
$b_3(3)$	7.57	8.46	8.11	5.65	9.09	8.71	12.34
$b_3(16)$	3.37	4.38	3.79	2.42	4.91	3.59	4.98
$b_3(22)$	-10.65	-12.19	-11.03	-7.69	-13.46	-11.55	-16.78

Key:
1. Locality   3. Pinggu   5. Daxing   7. Haidian
2. Shunyi   4. Tongxian   6. Zhaoyang   8. Fengtai

11

These results coincide with common experience. We know the elements of the formation of the yield of wheat are the number of spikes, the number of grains, and the weight of grains. The number of spikes is mainly determined by the number of tillers. In the Beijing suburb, the number of spikes is primarily determined by the number of large tillers at low levels. The most suitable temperature for tillering is between 13° and 18° C (3), but during the middle 10 days of October in the Beijing suburb after the wheat plants have entered into the tillering stage, the average temperature drops to below these temperatures. Therefore, higher temperatures prior to winter generally are advantageous to an increase in the number of tillers prior to winter. This in turn is advantageous to increasing the number of spikes and the yield. Early spring temperatures have a greater positive effect. One reason is because such temperatures affect tillering in early spring. The percentage of formation of spikes from tillers of early spring is not high. But according to the results of this article and averages over many years a definite contribution to the final yield is made. The second reason is because such temperatures affect the growth period of wheat. When the temperatures are high, the growth period is moved earlier. This facilitates extending the time for filling and raising the weight of grains. One characteristic of the climate in Beijing is that temperatures rise quickly in spring. During the middle 10 days of May, the average temperature will have already reached 20°C and often will have surpassed 23°C. Temperatures during the filling period have a greater negative effect upon yield. This indicates that during this period, the climatic conditions are often unsuitable for wheat. The temperature always seems to be too high. And because of high temperatures, there is less accumulation of dry substance and less of it is transported to the panicles. Moisture in the seed grains is quickly lost, the plants easily wither early and the yield of seed grains drops.

Therefore, the coefficient of the effect of the major temperature factor selected by step-by-step regression not only stands out statistically but its biological significance is also very obvious.

(5) Rainfall and sunshine are secondary meteorological factors affecting the yield of winter wheat.

During the seedling period and the filling period, the effect of rainfall increases correspondingly. The effect of the total amount of rainfall during the growth period is not obvious. In the analysis at a single locality, there are some places that have a rather high single correlation coefficient between yield and the total amount of rainfall (Table 4). But in the step-by-step regression analysis of many localities, the factor of the total amount of rainfall is not included because of the presence of other factors. Only the second power term representing rainfall is outstanding. Figure 3 describes the seasonal changes of the coefficient of the effect of rainfall when sunshine and temperature conditions do not change. During the seedling and filling period, the coefficients of the effect of rainfall are all positive in value and are larger than the absolute values of other periods. Wheat needs a lot of moisture during its

12

seedling period. Even though the conditions of irrigation in the Beijing suburb have greatly improved, the planting system has also undergone change. Interplanting consumes the large amounts of moisture accumulated in the soil during the rainy season. Therefore, the coefficient during the seedling period is positive, i.e., a certain degree of deficiency of moisture still exists. At this time, rain is often still beneficial. Wheat also requires large amounts of moisture during the filling period. But in recent years, sufficiency of water for filling and for yellowing of wheat plants cannot be assured because of various reasons. The results of this article show that during this period the problem of a deficiency of water actually exists. Therefore, generally speaking, the importance of water for filling and for yellowing should be emphasized.

From December to April, the coefficients of the effect of rainfall become negative. The intrinsic significance of negative values can only be explained in exact terms after more profound investigation and study. At present we only point out the following facts. Under the production level of the recent decade, the supply of water has been sufficient during the period between the wintering time of wheat and the time before heading and flowering. More rainfall is not advantageous. During the wintering period, wheat ceases to grow and the problem concerning the need for water does not exist. Because winter irrigation is widely practiced in the Beijing suburb, there is no deficiency of water during the period following the time the plants return green. If there is more rainfall, it will lead to contageous rust disease and the yield will be affected. The negative effect may also indicate that there are still some unnatural factors in winter irrigation and management of water in early spring such as the problem of over irrigation and others which are worth consideration.

The effect of the hours of sunshine upon the yield is more pronounced than that of rainfall but far lower than that of temperature. Analysis at single localities shows the total number of hours of sunshine and yield have a higher negative correlation (-0.43 - -0.60). Analysis at many localities shows step-by-step regression only introduces the sunshine factor terms to the third power. According to Figure 4, the coefficients of the effect of sunshine over the entire growth period can be divided into two stages of negative effects and two stages of positive effects. During the period before winter a greatest negative value occurs and during the filling period a greatest positive value occurs. During the wintering period the curve shows a maximum value and during the period from March to April in early spring the curve shows a minimum value.

Solar energy is the energy source for the formation of yield. The significance of the positive effect of sunshine is obvious. But, it is not clear why a maximum positive value occurs during the first and middle 10 days of December when growth has already ceased and why do negative effects occur?

13

Since the sunshine factor is introduced into the equations under a rather high confidence ($\alpha = 0.001$), the possibility of chance is not great. We conclude by inference that they are not self explanatory. This point cannot be neglected: they objectively reflect some problems which we have not yet taken into consideration at present (for example, certain secondary effects produced by sunshine). In fact, under other circumstances, we have encountered similar phenomena. Therefore this problem requires further investigation and clarification.

(6) It can be preliminarily seen from the information provided by this article that the period in which the effects of the three meteorological elements of water, light and temperature upon yield are the greatest is before winter and during the filling stage. The following concept is thus formulated: Under the weather conditions in the Beijing suburb, the two periods above are the sensitive periods in which meteorological elements affect the yield of wheat.

The above describes the several fundamental facts about the relationship between the yield of wheat and meteorological conditions in the Beijing suburb. These facts will be helpful to doing the work in wheat production well.

(1) Since temperature is the major influence upon the fluctuation of the yield, we should put more emphasis on reasonable adjustment of temperature in drawing up measures of agricultural production techniques, for example, the question concerning early sowing at appropriate times.

It is obvious from formula (1) that

$$\hat{y} = C + \sum_{i=1}^{3} \sum_{i=1}^{36} b_{ii} \cdot x_{ii} = C + \sum_{i=1}^{2} \sum_{i=1}^{36} b_{ii} \cdot x_{ii} + \sum_{i=1}^{36} b_{3i} \cdot x_{3i}$$

$$= C + \sum_{i=1}^{2} \sum_{i=1}^{36} b_{ii} \cdot x_{ii} + b_{T} \cdot \sum_{i=1}^{6} x_{3i} + \sum_{i=7}^{36} b_{3i} x_{3i},$$

where $t = 7$ is equivalent to the first 10 days of December which is the beginning time of the wintering period and $\sum_{t=1}^{6} X_{3i}$ actually represents the cumulative temperature before winter, $b_{T} = \sum_{t=1}^{6} b_{3i} \cdot X_{3i} \bigg/ \sum_{t=1}^{6} X_{3i},$

Since the coefficient of the effect of temperatures before winter b_{3t} are all positive values, b_{T} is also positive in value. This means the cumulative temperature before winter and the yield are positively correlated.

This also means the cumulative temperature before winter is the important factor affecting fluctuations in yield. This kind of positive correlation reflects an outstanding problem at least during the recent decade in wheat production. It is the frequent deficiency of the cumulative temperature before winter. Cumulative temperature before winter can be improved by adjusting the sowing time. Thus, striving to sow early is still an important measure to increase yield in the cultivation of wheat.

(2) How can reasonable and economical irrigation be carried out? Should irrigation to stimulate the plants to return green be done early or late and how can it be most suitably done? According to the results of this article, appropriately late irrigation and less irrigation are better because: first, early irrigation can lower ground temperature; second, the effect of rainfall in March and April is negative in value. Of course an overall solution must also take into consideration other related problems. Here, we present only the theoretical basis of one aspect.

(3) Both the effect of temperature and the effect of rainfall indicate that irrigation for filling and yellowing of wheat during the latter period of growth of wheat is advantageous to increasing yield.

(4) Equations (3) and (4) can be used to compile forecasts of the yields of winter wheat. At this time, the tendency term can be substituted by the actual yield of the previous year or the average of the actual yields of the most recent 2 to 3 years. Meteorological data can be taken from long range weather forecasts. At different stages of the growth period, step-by-step revisions can be made using the actual weather conditions of the previous period and the average value of the weather conditions for the coming period.

Incidentally, due to the limited purpose of this article, we used only a linear model in the analysis to obtain the above concept which naturally has its limitations. A nonlinear model will be discussed in another article.

9296
CSO: 4007

'GONGREN RIBAO' ON 'GIVING PRODUCTION QUOTAS TO HOUSEHOLDS'

HK290823 Beijing GONGREN RIBAO in Chinese 15 Jan 80 p 4 HK

[Article by Mo Fei [5459 7236]: "Some Thoughts on 'Giving Production Quotas to Households'"]

[Text] "More plots for private use, more free markets, more enterprises with sole responsibility for their own profits and losses and giving production quotas to households" was once a famous slogan. Almost no one ever doubted its capitalist nature. Unexpectedly, people have now put forward differing views on this long criticized slogan.

In a meeting held recently by the Sichuan Provincial CCP Party Committee, some county party committee secretaries held that there should be more flexibility in rural economic work, laborers should be given more "small freedom" and output quotas of many production items should be fixed on a group, household or individual basis. They affirmed that there should be two prerequisites for "giving production quotas to households." One is public ownership of the means of production and the other is the principle of from each according to his ability, to each according to his work.

These two prerequisites have been appropriately put forward. Once we grasp these two prerequisites, we grasp the essence of socialism. Historical materialism tells us that production relations are first of all decided by the relations between producers and means of production. Ownership of the means of production is the basis of production relations. Each type of ownership determines its social system. Public ownership of the means of production together with the principle of from each according to his ability, to each according to his work are the distinctive features of the socialist system and the main criteria by which we distinguish socialism from capitalism or any other form of exploiting system. We must judge whether or not a policy, principle, slogan or measure is a socialist one by means of these two prerequisites, these are the scientific criteria for testing the nature of "giving production quotas to households." Some comrades cannot distinguish between socialism and capitalism. The main reason is that Lin Biao and the "gang of four" arbitrarily uses the label of capitalist and obscured the demarcation line between right and wrong. Another important reason is the

16

lack of objective criteria for distinguishing socialism from capitalism. Now that the party committee secretaries have stressed these criteria, everyone can see the light.

We can interpret "giving production quotas to households" in two ways. One is allowing land and the means of production to be owned and managed by households which then deliver part of the products to the collective. This interpretation is wrong. Another interpretation is that land and the main means of production are owned by the collective. Only the output quotas of some farmwork are fixed on a household basis. These households then get remunerations according to output and rewards for overfulfilling the quotas. This is in fact the responsibility system related to output which is practiced in many places. It is a system of "giving responsibility to households" rather than "giving production quotas to households," it is a system of personal responsibility in agricultural production. Practice has proved that wherever this system is practiced, the commune members' production enthusiasm is enhanced and output is increased. It not only improves the commune members' living standards but also develops the collective economy. Is this anything other than socialism?

[HK290831] Here, I can think of two questions.

One is that not all slogans criticized in the past are wrong and not all those affirmed are correct. Whether they are right or wrong should be specifically analyzed and tested by practice. "Giving production quotas to households" was widely known as a capitalist slogan. However, if we look at the actual agricultural production conditions in China at the present time, we can see that our agricultural production level and the degree of mechanization is rather low and that a great deal of farmwork is still done by manual labor. Under such circumstances, "fixing output quotas" for some agricultural production items "on a household basis" is beneficial to mobilizing the commune members' enthusiasm and developing production. As long as we persist in the principles of the public ownership of the means of production and to each according to his work, we remain socialist. When agriculture is modernized no mass production is realized in the future, things will be different. Of course, on condition that there is public ownership of the means of production and that distribution is based on to each is according to his work, we should also proceed from the actual situation of allowing every production team and brigade "to fix" output quotas for certain items produced "on a household basis." Moreover, we should continuously sum up experiences rather than do things blindly. Under no circumstances can we say "giving production quotas to households" is capitalist. We cannot regard a question of method as a question of road.

Another question is that we should distinguish truth from falsehood, good from evil and the beautiful from the ugly on the basis of objective facts rather than personal tastes or emotions. We should judge whether or not "giving production quotas to households" is good on the basis of whether it is beneficial to strengthening and developing the socialist system. We cannot say it is capitalist because it does not fit in with a certain mould or

with our personal preferences. We should not be prejudiced. We should not think that all slogans approved by ourselves are correct and get angry when other people object to them. If we use other people's experiences to understand "giving production quotas to households," we will be more realistic in considering problems.

CSO: 4007

BRIEFS

DEVELOPMENTS IN FISHERIES--Beij'ng, January 26--A crossbred carp was developed recently by scientists at the Yangtze River Aquatic Products Institute of the Aquatic Products Bureau. The carp, which is tender, contains 77.8 percent meat and weighs on average 1.5 kilogrammes after a year's growth. It is a cross between the Yuanjiang carp of Yunnan Province and the red purse carp of Wuyuan in Jiangxi Province. The carp is now being introduced to 20 provinces and municipalities and cross-breeding between red purse carp and other varieties is being carried out in Hunan and Hubei Provinces. Zhoushan Fish Farm, one of the largest in China, caught 390,000 tons of fish last year, exceeding the 1979 quota by 4.5 percent. The Huhaitang Fresh Fish Farm, with an area of 46 hectares, has been completed in Jinhua County, Zhejiang Province recently. It will breed 250,000 fry and produce 150 tons of fish each year. [Text] [Beijing XINHUA in English 0708 GMT 26 Jan 80 OW]

LIVESTOCK PRODUCTION IN 1979--Beijing, 8 Jan--China's herdsmen promoted livestock production with good results in 1979. The number of hogs kept in sties increased by more than 8 million head over 1978 and the total number of pigs procured by the state increased by nearly 20 million head over 1978. The number of sheep kept in sheepfolds increased by more than 7 million head over 1978 and the total number of sheep procured reached 10.7 million head, increasing by 11 percent over 1978. The total number of beef cattle procured in 1979 reached 1.5 million head, increasing by 10 percent over 1978. The total amount of fresh eggs procured in 1979 reached 1.65 billion jin, increasing by 48 percent over 1978 and the total amount of honey procured reached 105,000 dun, increasing by 8,000 dun over 1978. [OW101347 Beijing Xinhua Domestic Service in Chinese 0157 GMT 8 Jan 80 OW]

COLD STORAGE CAPACITY INCREASED--Beijing February 3 (XINHUA)--China built 121 cold storages with a total capacity of 100,000 tons in 1979. This is the biggest number of cold stores added since 1959. The new stores are used for preserving meat, chickens and eggs. They help to improve the meat and egg supply in Chinese cities. Construction of more cold stores has been planned for 1980. [Text] [OW031242 Beijing XINHUA in English 1201 GMT 3 Feb 80 OW]

19

BRIEFS

FARMLAND CONSTRUCTION--Anhui has made headway in farmland capital construction since the beginning of last winter. By the end of January, there were 3.8 million people working on the rural construction projects and more than 32,000 water conservancy works of various sizes were completed, while some 30,000 similar projects were still under way. More than 15.8 million mu of over-wintering crop fields were irrigated. [OW051017 Hefei Anhui Provincial Service in Mandarin 1100 GMT 4 Feb 80 OW]

ANHUI COUNTY GRAIN OUTPUT--The 1979 total grain output of Xuancheng County in Anhui reached as high as 619 million jin, up by 32 million jin from the 1976 figure. In the past many years the annual grain output of the county was around 500 million jin despite the fact that county was known as a granary. (Hefei Anhui Provincial Service in Mandarin 1100 GMT 4 Feb 80 OW)

ANHUI COUNTY MARKETABLE GRAIN--Hanshan County of Anhui turned in 100 million jin of marketable grain to the state last year, thanks to a bumper agricultural harvest reaped by the county with a population of no more than 350,000 and some 270,000 mu of arable land. (Hefei Anhui Provincial Service in Mandarin 1100 GMT 4 Feb 80 OW)

ANHUI PREFECTURE FIELD MANAGEMENT--The masses in Anhui's Fuyang Prefecture are intensifying field management with special attention paid to topdressing their wheat fields. As of 22 January, 3.71 million mu of wheat fields were topdressed, accounting for 35 percent of the total sown area. In addition, 431,000 mu of rape have also been topdressed, accounting for 57 percent of the planted acreage. (Hefei Anhui Provincial Service in Mandarin 1100 GMT 27 Jan 80 OW)

ANHUI COUNTY BUMPER HARVEST--Hefei, 25 Jan--In 1979, Fengyang County in Anhui Province reaped a bumper harvest. The total grain output of this county in 1979 reached 441 million jin, increased by 20 percent over that of 1977, the record year. The total output of oil-bearing crops reached 14 million jin, increasing by three times over the past record. The county turned in to the state over 84 million jin of grains, 75,000 head of pigs and 1.55 million jin of eggs. The per capita income reached 150 yuan and per capita grain ration reached some 700 jin. (Beijing Xinhua Domestic Service in Chinese 0106 GMT 25 Jan 80 OW]

20

BRIEFS

RURAL MATERIAL SUPPLY--According to statistics in 1979, 493 people's communes and 20 state farms in 56 counties and municipalities of Fujian set up a material supply network. In 23 counties and municipalities, trial points were set up in every commune. These networks and trial points supply the materials for the commune members' production and daily life. At the same time, the departments concerned have formulated rational increases in the supply of various material to the countryside, including ball-bearings, electric wires and other common materials including rolled steel, pig iron, cement, glassware and asbestos products. [HK270812 Fuzhou Fujian Provincial Service in Mandarin 1035 GMT 21 Jan 80 HK]

FUJIAN GRAIN PROCUREMENT--There was a bumper grain harvest in the province in 1979. Many peasants still had excess grain after fulfilling the year's procurement task. Grain departments in all places have actively promoted procurement of grain in negotiated prices. Shaowu County procured 13 million jin of grain in this way. According to statistics from various places, 100 million jin of grain was procured at negotiated prices by 8 January. [Fuzhou Fujian Provincial Service in Mandarin 1035 GMT 12 Jan 80 HK]

FUJIAN RURAL DISTRIBUTION--According to incomplete statistics, 21 counties and municipalities will be able to distribute an average of 100 yuan to each person including eight counties and municipalities which will be able to distribute 130 yuan to each person while eight other counties will be able to distribute 110 yuan and five counties will be able to distribute 100 yuan to each person. [Fuzhou Fujian Provincial Service in Mandarin 2300 GMT 2 Jan 80 HK]

CSO: 4007

FOREST RESOURCES DEVELOPED TO PROMOTE AGRICULTURE

Forest Resources

Guangzhou NANFANG RIBAO in Chinese 19 Dec 79 p 2

Editor's Note: Not long ago, the Provincial Committee invited agricultural experts and teachers from our province to take part in an informal discussion on accelerating the development of agricultural production and doing a good job in rural area construction. The experts and teachers who came to the conference liberated their thinking, breached forbidden areas, freely exchanged views and spoke their minds in an uninhibited manner in sorting out some of the pressing, major problems in the agricultural development of our province and raised several positive suggestions and valuable opinions. These were all very useful in stimulating thought, drawing on collective wisdom and absorbing all useful ideas and improving work. Today, we have selected a portion of the discussion for publication and will continue to select more in the future in the hope that we will attract the attention and consideration of party and government organizations at various levels. We also hope that they will select the exemplary points and follow them in order to make it easier to progress in work reform and engage in the agricultural industry of our province as soon as possible.

[Article: by Shen Pengfei [3088 7720 7378] of South China College of Agriculture; "Protection of Forest Resources Necessary for Development of Agriculture"]

[Text] The acceleration of agricultural development may be discussed from the many aspects of politics, economics, sciences, and technology. The author proposes to discuss it from the aspect of the scientific and technological relationship between agriculture and forestry in this paper.

Everyone knows that water is necessary for the growth of crops. If there is to be an abundant agricultural harvest, water conservancy must be emphasized, but in order to control the water, the mountains must be regulated. If forests are destroyed, the source of water will necessarily be exhausted and a large quantity of soil will also be lost. This would be very unfavorable for agricultural production. Due to the destruction of

forests in the region of the Songtao Reservoir in Hainan Island, the flow
of the reservoir has dropped from the original 100 million m^3 to the
present 56 million m^3. The typhoon of 1977 caused the collapse of one
third of the bald mountains in Baisha County. A large number of farms
and dwellings were destroyed in the process which created tremendous
losses. If forestry had been developed or if forest resources had been
well managed to control the sand and the wind and prevent the loss of
water and soil, abundant harvests of crops would have been guaranteed.
In Guangdong Province, 70 percent of the area are mountains, 10 percent
water, and 20 percent land. The mountains area, therefore, has great
potential. There are close to 180 million mu of land suitable for affor-
estation. For this reason, the question of preservation and development
of forests in the mountainous and hilly regions versus their destruction
is extremely important and absolutely must not be ignored.

Since the establishment of the nation, the people of Guangdong have strug-
gled to maintain their spirit of self-reliance, and performed a great deal
of work in developing forests and building up the mountainous regions.
Their contribution is very great. It must be observed that due to serious
interference by the extreme leftist line of Lin Biao and the gang of four
and prolonged neglect in the matter of placing the work of the mountainous
regions in its proper place, not a few problems exist in the goals, poli-
cies, and systems of production, while aid to the mountainous regions from
the state has also been insufficient. Because of this the production in
the mountainous regions cannot go up and for the livelihood of the people
to be relatively difficult. In some communes and brigades, there is dif-
ficulty even in maintaining simple reproduction.

Moreover, the numerous changes in systems have also been an important rea-
son for the destruction of forest resources. The "wind of communism" blew
in 1958; the "wind of combining brigades" blew in 1968; the "wind of di-
viding brigades" appeared for a while this year. Because of the change in
systems, forests restrictions were violated resulting in unregulated and
harmful logging. The most recent unregulated logging lasted especially
long. The area of damage and the loss of resources was unprecedented. In
this manner, the forest resources are destroyed, and the security of the
society and the orderly production process are disturbed as well. The re-
sults are damaging politically as well as economically. As a matter of
fact, the laws regarding the protection of forests were proclaimed by the
state long ago and this disaster was definitely preventable. Even if such
an incident should occur, if the leaders had organized the manpower to con-
trol it in time, it would not be enlarged daily to such an extent. Today,
the Provincial Committee has given attention to this problem. A work con-
ference for the forested regions of the entire province has been called to
decide quickly matters relating to forest construction, to provide a foun-
dation for the agriculture of Guangdong.

This is a desirable situation. It is hoped that the leaders of the various
levels will seriously implement the resolutions of the conference according
to the viewpoint of the Provincial Committee, while the Provincial Commit-
tee will not hold the matter back to let it stay at the level of slogans.

Manpower must be organized to promote inspections so that all the goals, policies, and measures will be carried out for the purpose of promoting the advancement of agricultural and forest production.

Protective Forest Zone

[Article: by Xu Yanqian [1776 3601 0578] of South China College of Agriculture; "An Agricultural and Forest Network Should be Established in the Zhujiang [Pearl River] Delta"]

[Text] The Zhujiang Delta is a famous base of commercial grain production in Guangdong Province. During every season in every year, crop-damaging weather, such as typhoons, "cold dew winds," etc. appears to affect the yield of early and late crops of rice. It is, therefore, necessary to use the roads provided for machine plowing and the banks of drainage ditches to grow protective forests to make agriculture-forest networks for the improvement of the ecological environment. This action may reduce the damage from typhoons and "cold dew winds," so as to guarantee a high and stable yield of grains.

The major function of farm protective forest belts is to reduce the wind speed. When the wind blows onto the forest belts, a portion of the wind power enters the forests and is obstructed by the trunk and branches of the trees to produce many small eddies, which collide and rub against one another to consume a part of the energy, and the speed of the wind will thus be gradually weakened. Another portion of the wind power will be forced to rise along the edge of the forest and to pass over the tree cover before coming down to merge with the air current that has blown through the forest. The two currents will collide against one another again to cause a great deal of weakening of the wind power.

Due to the fact that a forest zone acts to reduce the wind speed and to cause current exchange action of the protected area to be weakened, it can lead to a change of the micro-climate. Generally speaking, the temperature of the spring, autumn, and winter may be 1-2°C higher, and that of the summer may be 1-2°C lower. It has the same effects on the soil temperature. When the forest zone reduces the wind speed and weakens the current exchange action, the upward moisture loss due to soil and crop evaporation is lessened and therefore, the absolute humidity of the close to the surface ground layer is increased. At night, the temperature is lower and the relative humidity is correspondingly higher, to about 5-10 percent under normal conditions. The reduction of wind speed and increase of humidity will necessarily induce a great reduction of soil and crop evaporation, to about 20 and 25 percent respectively. All in all, the soil moisture content will be increased 1-4 percent.

In the winter of 1975, the Songshugang Brigade of Changning Commune, Boluo County planted a protective forest measuring 1.8 km in length. By the

autumn of 1978, the average height of the trees was 6.94 m. In mid and late October, there were two occurrences of "cold dew wind." The late rice within 200 m on the leeward of the forest zone averaged above 50 percent fruiting rate, while it was only 11.7 percent in the control area. After the "cold dew wind" of 1979, the Xinhui County Bureau of Forestry carried out a survey in the four communes of Liluo, Huaicheng, Gujing, and Daze to determine the efficiency of protective forest zones. It was discovered that compared with control areas with no protective forest zones, the yield per mu of the area with protective forest zone was 33.9 percent higher.

These facts demonstrate forcefully that farm protective forest zones can indeed reduce the damage of "cold dew wind." Whether or not the damage by typhoon can also be reduced or eliminated cannot yet be determined scientifically due to lack of sufficient data at present, but as far as the forest zone resisting typhoons and minimizing the wind power, the forest is still useful. Thus, we believe, if an optimum formula is established to establish farm protective forest zones in the Zhujiang Delta to implement networks of fields and forests, with additional trees and border afforestation to reach a rate of tree cover of 10 percent, within a short period of time the physical characteristics of the ground surface will change, the soil fertility will improve, and there will be a profound change in the micro-climate. When other effective measures of modernized agriculture are also adopted, a relatively great breakthrough may occur to the agricultural, forestry, and animal husbandry productions of the entire Zhujiang Delta.

6168
CSO: 4007

BRIEFS

NATURAL RUBBER PRODUCTION—All state farms under the provincial farmland reclamation bureau of Guangdong are exerting greater efforts to increase natural rubber production. Statistics show that: manpower allocated to rubber production for the first half of 1979 was 15.8 percent higher than that of the same period of 1978; investments on land reclamation for growing more rubber plants and on field management and planting of rubber plants were readjusted to 5.52 percent higher than the original plan; and the number of machines and amount of chemical fertilizer and farm chemicals allotted for rubber production were also higher than in previous years. As of 10 September 1979, the amount of dry rubber produced registered an 8.7 percent increase [presumably over the comparable period of 1978]. [Guangzhou NANFANG RIBAO in Chinese 15 Oct 79 p 1]

LINGSHUI LATE RICE CROP—Harvesting of the late rice crop has been completed in Lingshui County of Guangdong. According to initial statistics, the total yield from the late crop could be at least 10 million jin higher than that of the same period of 1978. During the autumn of 1979, some 18,800 mu of land were afforested, the best record in the past 15 years. [Guangzhou NANFANG RIBAO in Chinese 4 Dec 79 p 1]

AQUATIC PRODUCTION DROPS—In 1959, the area for raising fish, shellfish, seaweed and other aquatic products in shallow ocean water along the coast of Guangdong was 376,000 mu, producing 22,145 tons of aquatic products. By 1978, the area had been reduced to 255,000 mu, the total output was down to 8,400 tons, and its production position dropped from 2d place to 6th place in the nation. [Guangzhou NANFANG RIBAO in Chinese 4 Dec 79 p 1]

SHANTOU FRUIT PRODUCTION RESTORED—In the past 2 years, 650,000 mu of fruit forests were improved through an active restoration program in Shantou Prefecture of Guangdong. Last year, the total fruit output of this prefecture reached 2.14 million dan [piculs], a 33-percent increase over 1976. This year the fruit tree acreage has been expanded by more than 16,000 mu. With 287 varieties of fruit trees, this prefecture is a major and well-known fruit producing area of China. [Guangzhou NANFANG RIBAO in Chinese 23 Oct 79 p 1]

FARM PRODUCTION IN TAISHAN COUNTY--After reaping a "good harvest" from its early rice crop, Taishan County of Guangdong also achieved a "bumper harvest" from its late rice crop in 1979. The total yield from its late rice crop was 30 percent higher than that of 1978. During 1979, this county expanded its afforestation acreage by 100,000 mu, its mulberry tree acreage by more than 7,000 mu, its fish raising area by some 20,000 mu and its beef cattle and goat herds by nearly 10,000 head, while raising more pigs and poultry. During the late rice harvest, it also planted 15 wheat, vegetables and medicinal herbs. [Hong Kong WEN WEI PO in Chinese 2 Dec 79 p 6]

FARM INCOME OF SHUNDE COUNTY--The total farm income in Shunde County, Guangdong for 1979 was more than 197.9 million yuan, of which over 53 million yuan came from pond fish, over 43 million yuan from sugarcane, over 23.66 million yuan from silk cocoons, over 23.5 million yuan from rice, and over 52.3 million yuan from other rural products. [Hong Kong WEN WEI PO in Chinese 24 Jan 80 p 6]

ANOTHER CHICKEN FARM--A newly built chicken farm, known as Baiyun Meat Chicken Farm, has been officially put in operation in the Baiyunshan Farm of Guangzhou City. This farm raises meat chickens introduced from the United States and has a planned capacity for producing 250,000 meat chickens a year, with each chicken caretaker raising [sic] 40,000 chickens a year. This farm, together with a chicken breeding farm and another chicken farm producing eggs in the suburbs form a mechanized system for producing both chickens and eggs. [Hong Kong TA-KUNG-PAO in Chinese 11 Jan 80 p 3]

JOINT COMPANY--The Guangzhou Municipal (Baiyuan) joint agriculture-industry-commerce company was founded on 29 January. The company combines production, processing and marketing under one roof. Located in suburban Guangzhou city, it employs 10,000 workers under the all-people ownership system and another 5,500 workers under the collective-ownership system. It has 24,280 mu of land of which, 9,200 mu is farmland, 2,000 mu is orchard, and 12,300 mu is forest. It has mechanized hog and chicken farms and fishponds, and runs farm machinery repair, medical treatment, foodstuff processing and other services. It has opened nine retail stores in Guangzhou to sell the company's farm, livestock, industrial and sideline occupation products. It has made contact with foreign businessmen on reciprocal trade and processing service. [OW051126 Beijing Domestic Service in Mandarin 2230 GMT 2 Feb 80 OW]

FOSHAN PREFECTURE FISH--The total output of pond fish in Foshan Prefecture reached 2.4 million dan in 1979, an increase of 5 percent over 1978, which was the highest level recorded previously. The people in Shunde County mainly produce pond fish. Their output in 1979 was 1.02 million dan, earning an income of 50 million yuan. [Guangzhou Guangdong Provincial Service in Mandarin 1130 GMT 21 Jan 80 HK]

GAOZHOU COUNTY GRAIN--In 1979, the people in Gaozhou County delivered 100 million jin of grain to the state, the highest in the past 10 years. By 10 December, 99.4 million jin of grain have been stored. At the same time, 23.53 million jin of surplus grain were also sold. In 1979, the cadres and commune members in this county had overcome spring and autumn drought and serious insect pests, reaping bumper harvest of grain throughout the year. The 4,000 production teams in the county had sold 20 million jin of surplus grain to the state. [Guangzhou Guangdong Provincial Service in Mandarin 1130 GMT 14 Jan 80 HK]

HAIKANG COUNTY GRAIN--By 14 December, Haikang County had already purchased 10.5 million jin of surplus grain. The county reaped a bumper harvest in grain in 1979. However, the grain departments in some areas did not have enough funds and fertilizer for rewards and had not purchased the peasants' surplus grain in good time. With the support of the higher level departments, 1,500 tons of fertilizer and a large sum of funds were allocated to the basic-level units. By mid-December, 14 out of 18 communes in the county had sold surplus grain to the state. [Guangzhou Guangdong Provincial Service in Mandarin 1130 GMT 14 Jan 80 HK]

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BUMPER HARVESTS CREATE WORRIES

Worries Expressed by Farmers

Beijing RENMIN RIBAO in Chinese 24 Nov 79 p 3

[Article by the Propaganda and Commerce sections of Qindeli Farm in Heilongjiang]

[Text] Recently, broadcasts and newspapers reported a bumper harvest of wheat on Heilongjiang's state farms. This is a joyous event yet the leadership and masses on our farm have become worried.

One worry is that no place wants the harvested grain. This year the amount of wheat that our farm has to deliver to the state was to reach 28 million jin, yet by the middle of October the delivery reached only 9,740,000 jin. Our farm under the jurisdiction of the Tongjiang County granary began delivering grain on 25 August but the 60,000 gunny sacks from the granary did not reach our farm until 6 September. After the beginning of the autumn harvest, 30,000 tons of soy beans had to be harvested, but there was no apparatus nor place to store the grain.

The second worry is that there are still several hundred tons of grain (wheat and soy bean) left over last year in the granary occupying the storage facilities.

The third worry is that recently the rainfall in our area has been relatively frequent, and moldy and rotten grains have already appeared.

Round-up Report of an Investigation

Beijing RENMIN RIBAO in Chinese 24 Nov 79 p 3

[Text] This year, there was a general bumper harvest of grain on Heilongjiang's state farms. This was originally a joyous event but because a large amount of grain cannot be delivered to the state, it has created worries.

At the end of October, when we came to the delta of the Songhua, Heilong and Wusuli Rivers, the autumn harvest was in its final stage. Ten years

29

ago, the area was all marsh land. Each year, since the establishment of
state farms, an average of 500,000 mu of uncultivated land has been
reclaimed. Over 4 million mu of the 22 million mu of land has already been
brought under cultivation. With an average yield, each year about 300 million
lion jin of grain are turned over or sold to the state. Each year several
billion jin of grain are turned over or sold to the state by all farms in
Heilongjiang. On one occasion a leading comrade of the provincial party
committee happily said to comrades of State Farms Bureau: "In the past
when a steamed roll was eaten in Heilongjian half of it was made from your
farms' flour. Now the greater part of it is." Grain production has
increased extremely fast and the worry over the delivery of grain has become
a general problem for nearly all the farms in Heilongjiang.

We went by car from Jiansanjiang Farm Administration Bureau to the Wusuli
River by way of Qinglongshan and Qindeli farms. In the vast fields the
combine harvesters were busy harvesting. In the drying yards the production
teams were piling up the yellow soy beans. The grain trucks were moving
quickly on the road. It was really a sign of a bumper harvest. When we
came to the granary at Qindeli it was already passed two in the afternoon.
Lined up at the gate of the warehouse were over ten trucks which had been
waiting there since morning to deliver grain. The drivers hadn't even eaten
lunch. Because it had just snowed a little the granary would not allow the
trucks to unload. Several drivers lost their patience and took the grain
back to the farms. Others after repeated requests managed to unload by
nightfall. These conditions wherein grain cannot be delivered are also
visible in other places. In front of some granaries the trucks are lined
up for as far as two li waiting to deliver grain.

Why is the delivery of grain this difficult?

One reason is that the designated granaries are few and far away. Granaries
that are relatively close are at a distance of 70 or 80 li and those that
are far are 170 or 180 li away. Working from dawn to dusk only one trip can
be made a day. In 1966 the Hongxinglong Farm Administration Bureau delivered
350 million jin of grain to the state and in 1976 this increased to 730 million
jin. In these 13 years only one granary was added. For the 11 farms under
the Jiansanjian Farm Administration Bureau there are only five granaries.
Due to the scarcity of granaries and the long lines for delivering grain, the
time required for unloading a truck is 2 to 4 hours. At some granaries the
time required to unload a truck is as long as 6 to 8 hours.

A second reason is that the majroity of granaries do not have mechanized
equipment and completely rely on manpower for loading and unloading. For
example, Qindeli has only three standard granaries which are respoinsible
for receiving grain from the Qindeli farm and three other communes.

There is not one mechanized conveyor and the unloading of trucks and the
loading of grain aboard freighters are completely dependent on manpower.
Ten years after the building of the granary we still had no special boats
for transporting grain and had to rely completely on the coal boats of the

Shipping Bureau to pick up the grain on their way. The frequency of the boats is also not guaranteed. Last August and September at the height of the grain transporting period not one coal boat came by and the granary accumulated over 500 tons of grain. The old grain couldn't be moved out and the new grain couldn't be accepted. Last year 3,200 tons of wheat from the Qindeli farm were transported to four granaries. First it was transported to the Qindeli granary which only accepted somewhat over 1,000 tons, next it was sent to the Dongye granary which also could not accommodate it and then it was sent to the Fulidun granary. A trip from the Wusuli River to the Fulidun granary is over 250 kilometers and working from dawn to dusk only one trip can be made in a day. In order to transport the grain quickly, the farm had to employ trucks from four counties. In the end over 500 tons were left behind and, up to the end of October this year, they were still piled up in the yard. The period for harvesting wheat is only 20 odd days and the delivery of wheat cannot be finished in 4 to 5 months. Due to the scarcity of transport vehicles on the Qinglongshan farm, 3-1/2 months are needed to deliver 11,000 tons of grain. By the end of October, the Bei'an Administration Bureau still had 80 million jin of wheat that it hadn't sent out. Previously, the dealing of soy beans would not start until the delivery of wheat was completed, and so thet would not "see" each other. Now they not only see each other but also sleep together in the same yard sharing the same cover.

Due to the lack of transport facilities the grain merely piles up in the drying yards. Many farms under the Jiansanjiang Administration Bureau are newly constructed and many of the production teams do not have cement drying yards. Straw covering equipment is also relatively scarce and so during the rainy period, hundreds of tons of wheat would mold and deteriorate and could only be used as fertilizer. Each drying yard would lose no less than 10 tons of grain. This year one farm lost 200 tons of wheat due to mold. Some brigade leaders said with tears in their eyes: "This year's effort was again wasted." People have a saying about the difficulty of delivering grain: "People hope for a bumper harvest this year and hope for a bumper harvest next year, when a bumper harvest comes, it is all worries."

At present, the administrative system for managing the nation's grain is that grain produced by [State] farms is purchased and distributed by the state and if a locality wants to harvest more, than it should ask for instructions from the Ministry of Food. The granaries are the responsibility of the provincial food bureaus, but granary construction investment capital is limited in the provinces. Because of this, after bumper harvests in the last several years, the contradiction between the delivery of grain and the storage of grain has become increasingly greater.

The potential for increasing production of grain in the Sanjiang Plain is tremendous, but if the construction of granaries cannot keep up with the times, then the losses will become increasingly larger.

Bumper Potato Harvest Creates Worries

Beijing RENMIN RIBAO in Chinese 24 Nov 79 p 3

[Article by Zhang Zhenfan (1728 2182 5400) of the Nenjiang Prefecture Party Committee, Heilongjiang Province: "A Bumper Irish Potato Harvest Creates Marketing Worries in Nuohe County of Nenjiang Prefecture"]

[Text] This year there was a bumper harvest of irish potatoes in Nuche County but the cadres and the masses became worried. Of the over 400,000 tons of irish potatoes, aside from those consumed or to be used as seeds, there were still over 200,000 tons available for delivery or sale to the state. Yet the related departments only made arrangements for shipping 125,000 tons out of the county, leaving a surplus of 100,000 tons not being marketed. The only way out was to process the potatoes locally into starch. The 11 starch factories in the whole county were not even able to process 40,000 tons, and, therefore, there are still over 50,000 tons in the hands of the peasants. The starch was produced but could not be shipped out. The 11 starch factories produced 557 tons of starch but only managed to get rid of 230 tons.

This situation also exists in other counties in our area.

9480
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BRIEFS

SHUANGCHENG COUNTY PRODUCTS SOLD--According to statistics, Shuangcheng County, Heilongjiang Province, sold more than 400 million jin of market-able grain to the state in 1979. In addition, the county sold to the state 70,000 head of hogs, 1.02 million jin of eggs, 6 million jin of milk, 170,000 jin of poultry, 25 million jin of hemp, 80 million jin of sugar beets and 2.1 million jin of various minor species of oilseeds. [Harbin Heilongjiang Provincial Service in Mandarin 1100 GMT 7 Jan 80 SK]

MILK COWS INCREASE--By the end of 1979, the number of milk cows in Heilongjiang Province totaled more than 70,000 heads, an increase of 12.9 percent, compared with the corresponding period of 1978. [Harbin Heilong-jiang Provincial Service in Mandarin 1100 GMT 2 Jan 80]

GRASSLAND IMPROVED--During 1979, Heilongjiang Province rejuvenated and improved more than 287,000 mu of grassland, built 94,000 mu of planned rotational pasture, returned more than 250,000 mu of farmland to grassland, collected over 400,000 jin of grass seeds and sank more than 100 shallow wells on grassland. [Harbin Heilongjiang Provincial Service in Mandarin 1100 GMT 2 Jan 80]

HEILONGJIANG COUNTY AGRICULTURE--Harbin 3 Feb--Anda County has readjusted the economic structure within agriculture according to local conditions, switching from the single emphasis on grain production to all-round develop-ment of grain, sugar, livestock and sideline production. Encouraging changes have taken place in the past year. The county's total agricultural and sideline income in 1979 was 34 percent above the previous year. The average income of each commune member increased from 80 to 90 yuan in 1978 to about 130 yuan in 1979. In addition, income from family sideline production averaged 60 to 70 yuan in 1979. Over 70 percent of the county's 1.56 million mu of cultivated land is alkali land, which is more suitable for growing beet than grain crops. The county has 2.6 million mu of grassland which is good for developing animal husbandry. [Beijing Xinhua Domestic Service in Chinese 0336 GMT 3 Feb 80 OW]

CSO: 4007

33

BRIEFS

TIANJIN COMMENDS ADVANCED FARMS--The 1979 Tianjin municipal awards rally for advanced state farms took place on 23-24 January in Tianjin Municipality. At the rally seven advanced units were issued brocade banners and 99 advanced collectives and 199 advanced workers were awarded certificates of merit. Yan Dakai and Yan Xing Yanzi, secretaries of the Tianjin Municipal Party Committee; Wu Zhen and Feng Qin, deputy secretaries of the municipal party committee; and Liu Jinfeng, vice chairman of the municipal revolutionary committee and director of the municipal agricultural commission, attended the rally. [Tianjin City Service in Mandarin 2330 GMT 25 Jan 80 SK]

PIGS, EGG PRODUCTION--In 1979, 4,843,000 pigs were purchased in Hebei, overfulfilling the state's plans by 243,000 head. This is an increase of 1.4 million head over 1978. The rate of increase is 40.6 percent. In Cangzhou, Zhangjiakou and Lanfang prefectures, the rate of increase exceeded the state's plans by 15 percent. The number of pigs delivered to Tianjin and Beijing also overfulfilled the state's plans by 2.4 and 5.8 times respectively. In 1979, 97.3 million jin of fresh eggs were purchased throughout the province, exceeding the state's plans by 22.3 million jin. This is also an increase of 50.15 million jin over 1979. The fresh eggs for export exceeded the plans by 13 percent. [Shijiazhuang Hebei Provincial Service in Mandarin 0430 GMT 17 Jan 80 HK]

OIL-PRODUCING CROPS DOUBLED--This year Tianjin municipality planted 361,400 mu of oil-producing crops. Total output of oilseeds is estimated at 26.61 million jin. Statistics as of the end of November, 9.28 million jin of oilseeds had been purchased from this municipality. This can produce about 2.24 million jin of edible oil, almost double the 1978 amount. [Tianjin City Service in Mandarin 2330 GMT 27 Dec 79 SK]

BUMPER HARVEST IN TIANJIN--Tianjin municipality has reported a bumper harvest of grain this year. Per-mu output has reached some 440 jin. Total production is estimated at more than 2.6 billion jin. [Tianjin City Service in Mandarin 2330 GMT 27 Dec 79 SK]

VEGETABLES AVAILABLE--Tianjin Municipality has made every effort to see that there is ample supply of vegetables on the market to meet the people's needs. From April to September, a total of 284 million jin of vegetables were supplied to the market, showing a 41 percent rise over the corresponding period of 1978. Although a recent cold spell caused damage to 30,000 mu of cabbages, every effort is being made to insure a normal supply of vegetables during this winter and early spring of next year. [Tianjin City Service in Mandarin 2330 GMT 27 Dec 79 SK]

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DESIGNER LISTS ADVANTAGES OF UNDERGROUND GRANARIES

OW071315 Beijing XINHUA in English 1252 GMT 7 Feb 80 OW

[Text] Zhengzhou, February 7 (XINHUA)--Underground grain silos in Henan Province designed by engineer Yuan Shimin, have aroused nation-wide attention for their many advantages.

The silos are built to store anything from one million catties of grain to eight million catties.

Engineer Yuan Shimin, now deputy director of the Henan Provincial Bureau of Food, began designing underground granaries in 1965.

Compared with silos built on the surface, underground silos of the same capacity cost only half as much, and in particular use only 10 per cent of the timber and steel normally needed. The cost of grain storage is much lower, averaging less than two yuan per ten thousand catties as against the national average figure of 18 yuan. Little arable land is wasted if the silos are built underground.

The air-tight conditions in underground granaries discourage the activities of worms and the development of mould, and therefore there is no need to burn aluminium phosphide and chloropicrin in the silos to combat these problems. Safety and hygiene are thus enhanced.

The temperature in the underground silos fluctuates between 15 and 20 degrees centigrade. Under these conditions, deterioration in the quality of the grain takes a much longer period of time. For example, wheat preserved for six years in ordinary silos has a germination rate of only 44 per cent, while wheat preserved for 12 years underground still has a germination rate of 94 per cent.

On the basis of his experience over more than a decade in building underground granaries of various sizes in different topographies and soils, Yuan Shimin wrote a book entitled "Underground Granaries," which was published by the China Building Industry Press last year.

"To my mind, future granaries should all be built underground," Yuan Shimin said.

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BRIEFS

HENAN GRAIN DISTRIBUTION--Zhengzhou, 29 Jan--In 1978, per capita grain distribution from collectives to peasants in Henan Province increased about 20 jin over 378 jin in 1978. This distribution plus income from sideline production on private plots toalled more than 500 jin per capita grain for most peasants in the province. [Beijing Xinhua Domestic Service in Chinese 0728 GMT 29 Jan 80 OW]

CSO: 4007

BRIEFS

QIANJIANG COUNTY GOATS--By the end of 1979, the communes and brigades in Qianjiang County had raised 2,300 goats, an increase of 1.6 times over 1978. There are 10 goat-raising bases in the county. The county had also purchased 700 breeding goats from other areas. The agriculture departments in the county had held training course for 60 persons on goat-raising so as to improve the skill of goat-raising. [Wuhan Hubei Provincial Service in Mandarin 1100 GMT 23 Jan 80 HK]

MANAGEMENT SYMPOSIUM--From 3 to 7 January, the Hubei Water Conservancy Bureau and the provincial Finance Bureau jointly held a symposium in Xianning County of fish-breeding in reservoirs, on comprehensive management and on water and soil conservation. The symposium demanded that while insuring the safety of water conservancy projects and making the most of these projects, the units of all water conservancy projects throughout the province must make full use of the water and soil resources, vigorously carry out comprehensive management, strive to provide the society with products and create wealth for the state. Over the past few years, the units of all water conservancy projects in the province have done well in comprehensive management of reservoirs. However, no fish have been raised in about 400,000 mu of the reservoirs' surface in the province. The symposium demanded that the departments of the water conservancy projects in all places carry out economy management, install machinery to generate electricity where there is a river, run processing industry where there is electricity and raise fish where there is water. The symposium stressed that the province should particularly grasp well fish-breeding in reservoirs. Approximately one-third of the total water surface of reservoirs in the whole province can be used for raising fish. [Wuhan Hubei Provincial Service in Mandarin 1100 GMT 7 Jan 80 HK]

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BRIEFS

HUNAN AGRICULTURAL COMMENDATIONS--Changsha, 5 Feb--More than 500 advanced
units and 526 model farmers and advanced workers were commended at the
Hunan provincial meeting exchanging experience in applying agricultural
science and agro-techniques which closed here yesterday. The Sicong
commune of Chaling County has built dykes and water conservancy projects
and expanded its stable high-yield farmland from 32 percent to 98 percent.
Its per hectare grain output last year was 12 tons and cotton 0.78 tons.
Per capita income was 120 yuan as against 96 in 1978. Tian Qifa, deputy
secretary of the Suifeng production brigade party branch, Binnan County
has been experimenting with a three-crop system, that is two harvests of
rice and one of rapeseed every year, and developed good field management
and a fine strain of seed. Tang Dingwei, deputy director of the agricul-
tural science station of Lingguan commune, has accumulated 16 years'
experience in the control and prevention of rice diseases and insect
pests, including the use of natural enemies, and safe application of
pesticides. [OW051446 Beijing XINHUA in English 1225 GMT 5 Feb 80 OW]

TUJIA-MIAO PREFECTURE CATTLE--In early 1979, the departments concerned
of the state council had appointed the West Hunan Tujia-Miao Autonomous
Prefecture as one of the 14 commercial cattle bases throughout the country,
at present, 140 state and collective mangers have been built throughout
the prefecture, raising 2,800 cattle. The West Hunan Autonomous Prefec-
tural CCP Committee has exempted the tasks of grain procurement from the
communes and brigades in the commercial cattle bases. The state provides
assistance to those who do not have sufficient grain ration. The prefec-
tural CCP Committee also encourages the commune members to raise cattle
by themselves at home. The state will reward them with 100 jin of feed
for each cow the commune members privately raised. The Departments of
Finance and Foreign Trade have provided 2 million yuan of loans to the
production units to raise cattle. [Changsha Hunan Provincial Service in
Mandarin 1100 GMT 16 Jan 80 HK]

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BRIEFS

SHEEP RAISING--Nanjing, 1 Feb--Twelve counties and cities in Jiangsu Province have established bases for raising "Taihu Lake" sheep. Last year, they raised 300,000 such sheep and sold to the state 209,000 lambskins known as "soft precious stone" in the international market. The value of 10,000 lambskins equals that of 100 dun of pork or 1,250 dun of chemical fertilizer. A peasant can earn 70 yuan by raising one "Taihu Lake" sheep a year, including by-products. [OW041009 Beijing Xinhua Domestic Service in Chinese 0714 GMT 1 Feb 80 OW]

JIANGSU PREFECTURE AGRICULTURAL PRODUCTION--Husiyin Prefecture, Jiangsu, registered marked increase in output of grain, edible oil, pigs and silk cocoons in 1979. Grain output increased by 400 million jin over 1978; oil-bearing crops by 75 percent; pigs by 14.3 percent; and silk cocoons by 23 percent. [Nanjing Jiangsu Provincial Service in Mandarin 2300 GMT 1 Feb 80 OW]

JIANGSU COUNTY AFFORESTATION--Beijing, 1 Feb--The 1.25 million mu of large tracts of forests in Shuyang County of Jiangsu Province comprise basically of fine strain trees. At present, the accumulative volume of timber in this county has reached 750,000 cubic meters. [Beijing Xinhua Domestic Service in Chinese 0723 GMT 1 Feb 80 OW]

JIANGSU COUNTY GRAIN OUTPUT--In 1978, the grain output of Tongshan County increased by 170 million jin over that of 1977. The county's grain output in 1979 increased by more than 190 million jin over that of 1978. [Nanjing Jiangsu Provincial Service in Mandarin 2300 GMT 30 Jan 80 OW]

FARM PROFITS--Through improved management, state-run farms in Jiangsu turned long-time loss into profit in 1979. Their total profit in 1979 reached more than 24 million yuan. Among the province's 33 farms, 22 had a surplus. [OW132226 Nanjing Jiangsu Provincial Service in Mandarin 1100 GMT 11 Jan 80 OW]

INCOME DISTRIBUTION--Various communes in Jiangsu Province have implemented the policy of "to each according to his work" and "more pay for more work done" in the year-end distribution of income. The average cash for each commune member at the end of 1979 was 94.7 yuan, an increase of 9.3 yuan compared with the previous year. As of the end of December last year, a total of 10.96 billion jin of grain was delivered to state warehouses and 10.11 million tons of cotton were sold to the state. [Nanjing Jiangsu Provincial Service in Mandarin 2300 GMT 3 Feb 80 OW]

CSO: 4007

BRIEFS

SHANGRAO PREFECTURE FARMLAND CONSTRUCTION--By 9 January, 3,169 water con-
servancy projects and hydroelectric power stations were under construction
with 921 already completed. The speed of construction is faster and the
quality is better than last year. However, there are still some areas
which have not been properly handled. Some 42.4 percent of the farmland
in the prefecture still have not been properly irrigated by water conser-
vancy projects. Some 10 percent of the farmland in the vicinity of the
lakes suffer losses in production due to waterlogging and flood. Some 1.8
million mu of low yielding farmland still have not been thoroughly trans-
formed. The prefectural CCP Committee held a conference of the three-level
cadres in Wannian County in August 1979 to sum up and learn from Wannian
County in conducting farmland capital construction. In Wannian County,
95 percent of the total areas of farmland have effective irrigation.
[Nanchang Jiangxi Provincial Service in Mandarin 1100 GMT 15 Jan 80 HK]

CSO: 4007

BRIEFS

BUMPER AGRICULTURAL HARVEST--Changtu County, one of the grain-producing areas in Liaoning, reaped a bumper agricultural harvest in 1979. This county handed more than 700 million jin of grain over to the state. Its total grain output reached 1.48 billion jin, an increase of 13 million jin over that of 1978. [Shenyang Liaoning Provincial Service in Mandarin 1100 GMT 7 Jan 80 SK]

LIAONING FARM, INDUSTRIAL OUTPUT--Shenyang, 2 Feb--Conservative estimate puts Liaoning Province's total grain output in 1979 at 21.8 billion jin (actual output exceeds this figure). Last year, Liaoning also produced 1.7 million dan of peanuts. Per mu yield of rape rose to 53 jin. Total output of Liaoning's light industrial products reached 12.2 billion yuan in 1979, increasing 9.2 percent over 1978. [Beijing Xinhua Domestic Service in Chinese 1135 GMT 2 Feb 80 OW]

LIAONING COUNTY TIMBER PRODUCTION--Shenyang, 1 Feb--Xinbin County of Liaoning Province earned a total profit of some 2.7 million yuan in 1979 by turning in to the state some 60,000 cubic meters of timber. This county has a total area of forests of some 4.8 million mu, which accounts for 80.3 percent of the total area of the county. In 1979, this county afforestated an area of 166,000 mu of land and cultivated some 100,000 mu of saplings. [Beijing Xinhua Domestic Service in Chinese 0735 GMT1 Feb 80 OW]

FARMING PREPARATION--At a recent interview with a reporter of the Liaoning People's Broadcasting Station, (Zhu Chuanmin), director of the provincial agricultural bureau, pointed out that one important task at present is to quickly make preparations for spring farming. He called for prompt efforts to collect enough manure and select good seeds in time to meet the needs of early spring crop sowing, which is expected to begin about 20 days after the spring festival. Work should also be done to guard against potential floods this spring, he added. [Shenyang Liaoning Provincial Service in Mandarin 2200 GMT 22 Jan 80 SK]

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BRIEFS

BUMPER CROP--The state farms in Nei Monggol region reaped a fair bumper harvest of grains, oil-bearing crops and vegetables last year in spite of natural disasters. Total output of grains topped 600 million jin; commodity grains handed over to the state reached 180 million jin; oil-bearing crops 2.4 million jin; marketable vegetables 100 million jin. [Hohhot Nei Monggol Regional Service in Mandarin 1100 GMT 7 Jan 80 SK]

CSO: 4007

BRIEFS

AGRICULTURAL PROCUREMENT--Last year, Ningxia Hui autonomous region procured 205,000 pigs, 145,000 sheep and 3.5 million jin of eggs. This represented an increase of 24.2, 9 and 200 percent over 1978, respectively. [OW281426 Beijing Domestic Service in Mandarin 0400 GMT 28 Jan 80 OW]

CSO: 4007

BRIEFS

QINGHAI PREFECTURE IRRIGATION--Haixi Autonomous Prefecture in Qinghai scored good results in building power and water conservancy projects in 1979. It brought an additional 35,000 mu of grassland under irrigation, sank 37 wells, attached auxiliary equipment to 53 wells, improved irrigation on 9,600 mu of farmland and built four small hydroelectric power stations. [Xining Qinghai Provincial Service in Mandarin 1100 GMT 2 Feb 80 OW]

CSO: 4007

BRIEFS

YEAR-END DISTRIBUTION--The 1979 year-end distribution for rural communes in Shandong Province shows an increase over the 1978 record. According to the distribution plans covering the 13 prefectures and municipalities in the province, the total income of production brigades and teams amounts to 11.45 billion yuan, an increase of 12.8 percent over the 1978 figure. Each commune member receives an average 80.7 yuan, surpassing the 1978 income by 12.3 yuan. Food grain per individual is 437 jin, an increase of 30 jin over 1978. [SK210900 Jinan Shandong Provincial Service in Mandarin 2300 GMT 19 Jan 80 SK]

SHANDONG GRAIN AND OIL COMPANY--Shandong Province recently set up a company to handle purchases and sale of grain and oil at negotiated prices. The main tasks for the company are to exercise unified management of the province's purchases and sales of grain and oil at negotiated prices, to regulate the supply of grain and oil and their variety within the province and to undertake the province's trade of grain and oil with other provinces or with foreign countries. Its establishment will enliven grain and oil markets, stabilize prices, protect the peasants' interests and satisfy the daily needs of urban and suburban people. [Jinan Shandong Provincial Service in Mandarin 2300 GMT 2 Feb 80 SK]

AQUATIC PRODUCTION CONFERENCE--The Shandong Provincial People's Government recently held an aquatic production work conference in Jinan. The conference drew up a plan for developing aquatic production in 1980. It was stressed that while promoting fishery production, attention should be paid to preserving aquatic resources. [Jinan Shandong Provincial Service in Mandarin 2300 GMT 4 Feb 80 SK]

SOLAR ENERGY DRIED GRAIN--Jinan, 4 Feb--A building heated by solar energy to dry grains has been built in Jiaonan County, Shandong Province. Designed by technicians from the Jiaonan County Food Bureau, the building can handle 15 tons of grain daily, and heat in addition 7 tons of water to 60 degrees centigrade. [Text] [Beijing XINHUA in English 0706 GMT 4 Feb 80 OW]

CSO: 4020

BRIEFS

FRESH EGGS SUPPLY INCREASED--As of late September, 1979, the amount of fresh eggs supplied by Shanghai County to the City of Shanghai already exceeded 10 million jin, as compared with 7.86 million jin for the entire year of 1978. This county is one of the counties in the Shanghai suburbs that raises large numbers of egg-laying hens and ducks. [Shanghai WEN HUI BAO in Chinese 3 Oct 79 p 1]

RURAL SAVINGS, LOANS--As of the end of October, 1979, the amount of savings deposited by commune members of Shanghai suburbs exceeded those of the same period of 1978 by 77 million yuan to set a new record since the founding of New China 30 years ago. This averages more than 45 yuan for each person in the farming population, and this average is the highest in the nation. In the first 10 months of 1979, farm loans granted by China Agricultural Bank branches and credit cooperatives in Shanghai amounted to 212 million yuan, a 94-percent increase over the comparable period of 1978. [Shanghai JIEFANG RIBAO in Chinese 23 Nov 79 p 1]

CREAM PRODUCTION MEETING--The ministry of land reclamation held a meeting in Shanghai from 21 to 27 January. The meeting studied cream production by units under the ministry located in large and medium-sized municipalities throughout the country. The meeting was held to explore ways of expediting the development of cream production to meet the needs of the people, to exchange experiences in running dairy farms, and to discuss preparatory work for setting up a joint company for dairy enterprises in China. The meeting also commended departments in charge of farms in Shanghai, Beijing, Tianjin and Shenyang municipalities as well as 65 dairy farms. [Shanghai City Service in Mandarin 1130 GMT 28 Jan 80 OW]

CSO: 4007

48

BRIEFS

XINJIANG COUNTY AFFORESTATION--Beijing, 1 Feb--Shache County of Xinjiang Nygur Autonomous Region has planted 144 million trees in past few years, with each person planting 340 trees on the average. In the spring of 1979 alone; Shache County planted 23 million trees, with each person planting 54 trees on the average. [Beijing Xinhua Domestic Service in Chinese 0723 GMT 1 Feb 80 OW]

XINJIANG LIVESTOCK--At the end of 1979, the number of livestock in Altay, Xinjiang, was 2.25 million head in addition to 1.67 head of sheep. [Urumqi Xinjiang Regional Service in Mandarin 1300 GMT 29 Jan 80 OW]

XINJIANG FISH SUPPLY--During the spring festival period, more fish will be supplied to markets of Urumqi and Daramay municipalities, Xinjiang than in previous years. The Regional Marine Products Bureau has obtained about 6.8 tons of fish. Urumqi Municipality will have more vegetables for sale to the public during the spring festival period. [Urumqi Xinjiang Regional Service in Mandarin 1300 GMT 27 Jan 80 OW]

CSO: 4007

BRIEFS

XIAXING PREFECTURE AGRICULTURE--Xiaxing Prefecture, Zhejiang, increased per-capita income of its 4.45 million peasants to 190 yuan in 1979, up 29 yuan from 1978. In 1979 the prefecture's total grain output increased by 550 million jin over the previous year. The total output value of diversified economy reached 620 million yuan, topping 1978 by 110 million yuan. In 1979 each peasant household delivered to the state 1,880 jin of grain, 80 jin of silkworm cocoon, 28 jin of freshwater fish, 95 jin of rapeseed, 2.8 head of hogs and 12 jin of eggs. [OW151107 Hangzhou Zhejiang Provincial Service in Mandarin 1100 GMT 14 Jan 80 OW]

RURAL INCOMES INCREASE--According to reports received by the Zhejiang provincial departments concerned from all localities, in 1979 the province had 17,597 production teams whose per capita income from distribution exceeded 200 yuan. The number accounts for 7.1 percent of the production teams in Zhejiang. In 1978 there were only 5,695 such production teams. This higher income resulted from simultaneous development of agriculture, industry and sideline occupations in these production teams. [OW171423 Hangzhou Zhejiang Provincial Service in Mandarin 0400 GMT 16 Jan 80 OW]

MOUNTAINOUS AREA DEVELOPMENT--Hangzhou, 16 Jan--The Zhejiang Provincial CCP Committee has paid attention to economic development of the mountainous areas in the province. In 1979, the provincial party committee allocated some 316 million jin of grain to communes and brigades in mountainous areas to help solve the masses' food problem, and another 100 million jin of grain to support development of forestry, animal husbandry and other special productive activities. The provincial people's bank extended loans totaling 230.64 million yuan to 25 mountainous counties in 1979, an increase of 100.24 million yuan over 1978. Other departments also energetically supported the mountainous areas with money and supplies. In 1979, the total grain output of the mountainous counties was over 2.92 billion jin, an increase of 6.4 percent over 1978. The number of cattle in 1979 reached more than 191,000, an increase of 9,100 head; sheep over 268,000, an increase of over 61,000 over 1978. Forestry and economic crops also showed increases. [OW181455 Beijing XINHUA Domestic Service in Chinese 0218 GMT 16 Jan 80 OW]

ZHEJIANG RURAL PRICE CUT--Hangzhou, 27 Dec--Rural communes and brigades in Zhejiang Province, east China's major agricultural province, saved a total of 17 million yuan this year because of reduced prices of 70 items used in agriculture. The products include diesel engines, machine parts, threshers, sprinklers, sprayers, ploughs and plastic farm implements. [Text] [Beijing XINHUA in English 1307 GMT 27 Dec 79 OW]

BUMPER HARVEST--Zhejiang has reaped a total of 30 billion jin of grain in 1979, an increase of 2 billion jin over 1978 which was also a good harvest year. Owing to typhoon damage, cotton and hemp production has declined this year, but the province has achieved a record output of silkworm cocoons, rapeseed, tea and sugarcane. As of now, the province has 15 million hogs and 3.3 million sheep and has afforested 1.81 million mu of wasteland. It is expected that the 1979 total output value of the enterprises operated by the communes and production brigades of the province will reach as high as 3 billion yuan, topping last year's figure by more than 15 percent. [OW010903 Hangzhou Zhejiang Provincial Service in Mandarin 1100 GMT 22 Dec 79 OW]

ZHEJIANG AGRICULTURAL PRODUCTION--The grain output in Zhejiang hit an all-time high in 1979 with the total grain output reaching 30 million jin and the average per-mu yield of grain reaching 1,350 jin. The average per-mu yield of grain in suburban Hangzhou area, Haining, Yuhan, Huangyan, Wuxing, Xiaoshan, Shaoxing, Haiyan and Deqing counties was as high as 1,600 jin. There are 3.8 million mu of farmland in suburban Hangzhou and counties sown with grain crops, accounting for about 17 percent of the total acreage in the province sown with such crops. [OW081413 Hangzhou Zhejiang Provincial Service in Mandarin 0400 GMT 2 Jan 80 OW]

APICULTURAL DEVELOPMENT--Apiculture rapidly develops in Zhejiang. There are a total of 400,000 hives of bees raised in the province. The state procured 5.66 million jin of honey in the province during 1979, marking an increase of 1.1 million jin over that in 1978. The total output value in Zhejiang's apiculture has reached 80 million yuan in 1979. [OW081413 Hangzhou Zhejiang Provincial Service in Mandarin 0400 GMT 2 Jan 80 OW]

TALLOW TREE SEEDS--Beijing, 5 Feb--Zhejiang Province obtained a bumper harvest of tallow tree seeds in 1979. The total output was above 400,000 dan, nearly 30 percent higher than that in 1978. The seeds are usable for oil extraction and as raw material for making candles, soap and paint. [OW051446 Beijing Xinhua Domestic Service in Chinese 0238 GMT 5 Feb 80 OW]

ZHEJIANG PREFECTURE FISHERY--Hangzhou, 6 Feb--Preliminary statistics show that Zhoushan prefecture, Zhejiang Province, last year had a fish catch of over 7.5 million dan, worth 140 million yuan. Each seagoing fisherman received 300 yuan more from the collective's distribution of income than in the previous year. [OW061421 Beijing Xinhua Domestic Service in Chinese 0125 GMT 6 Feb 80 OW]

GRAIN PRODUCTION IN ZHEJIANG--Jiaxing County's total grain output amounted to 1.13 billion jin in 1979 as a result of efforts to improve economic accounting and cut down agricultural costs. Commune members' average income rose to 220 yuan, which is an increase of 35 yuan over 1978. [Beijing Xinhua Domestic Service in Chinese 0204 GMT 31 Jan 80 OW]

ZHEJIANG COUNTY PRODUCTION--In 1979, Shaoxing County, Shejiang, produced 1,690 jin of grain from each mu of grain field and thus increased total grain output by 150 million jin as compard with the 1978 production. In 1979, the county produced 187,000 dan of rapeseeds and collected and bought 380,000 head of pigs from pig-raisers. The 1979 total industrial output value of commune-run and brigade-run industries in the county was 160 million yuan. [Hangzhou Zhejiang Provincial Service in Mandarin 1100 GMT 26 Jan 80 OW]

ZHEJIANG COUNTY BUMPER HARVEST--Hanzshou, 25 Jan--Hsiyan County of Zhejiang province promoted competent, young cadres to leading posts and thereby developed agricultural production in 1979. This country's average per-mu grain output reached 1,508 jin in 1978, increasing by 393 jin over 1977; that of ginned cotton reached 144 jin, increasing by 32 jin; and that of rapeseeds reached 210 jin, increasing by 92 jin. The total output of both grains and oil-bearing crops surpassed the past all-time high. In 1979, the county's per-mu output of spring grains increased by 105 jin over that of 1978, that of rapeseeds by 29 jin and that of early rice by 62 jin. [Beijing Xinhua Domestic Service in Chinese 0122 GMT 25 Jan 80 OW]

CSO: 4007

II. PUBLICATIONS

TABLE OF CONTENTS OF DONGWUXUE ZAZHI, NOV 1979

Beijing DONGWUXUE ZAZHI [JOURNAL OF ZOOLOGY] in Chinese No 4, Nov 79 p 64

54

6168
CSO: 4007

BRIEFS

NANJING GEOLOGY BOOK--Beijing, 1 Feb--The recently published "Landscape Geology of Nanjing" can be used both as a guide for tourists and as teaching material in geography. It contains folk tales and fairy tales about well-known rivers, mountains, and historical sites in Nanjing, Jiangsu, as well as explanations in plain language about their physical and geological changes over the centuries. It was edited by Ying Weihan, a devoted geological engineer for 40 years. [Beijing Xinhua Domestic Service in Chinese 0714 GMT 1 Feb 80 OW]

CSO: 4007

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